PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re the Application of
Gharpurey (TI-31261) Conf. No. 2970
Serial No. 09/785,759 Group Art Unit: 2618
Filed: February 16, 2001 Examiner: Yun
For: A Radio Architecture for Use with Frequency Division Duplexed Systems

APPELLANT'S BRIEF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Appellant respectfully presents this brief in support of his appeal of the final rejection of claims in this case. The Notice of Appeal was filed on June 9, 2008, as indicated on the date of the automated receipt from the Patent and Trademark Office.

Real Party in Interest

The real party in interest in this application is Texas Instruments Incorporated.

Related Appeals and Interferences

The undersigned is aware of no related applications that are currently on appeal or in an interference that would be directly affected by this appeal, or that themselves directly affect or have a bearing on this appeal.

Status of the Claims

Claims 1, 4, 5, 7, 10, 11, and 13 through 15 were finally rejected in the Office Action of February 7, 2008, and are the subject of the present appeal.

Claims 2, 3, 6, 8, 9, and 12 were previously canceled.

Status of Amendments

No amendment was presented after the final rejection.

Summary of the Claimed Subject Matter

The invention of independent claim 1 is directed to a frequency-division duplexed radio that includes a transmitter section (126) and a receiver section including a down conversion section of first and second mixers (106, 108).[1] The receiver section receives a signal at a receive frequency different from the transmit band center frequency, and the first and second mixers receive a local oscillator signal at a frequency equal to the transmit band center frequency or a sub-harmonic of that frequency.[2] The radio of claim 1 includes first and second high pass filters (110, 112) that have inputs coupled to the output of the first and second mixers, respectively.[3] First and second sets of mixers (114, 116; 118, 120) are coupled to the output of the first and second high pass filters, respectively.[4]

Independent claim 14 is directed to a method of operating a receiver to remove interference caused by a transmitter. In the claimed method, the received signal is mixed with a local oscillator frequency that is equal to the transmit center frequency or a sub-harmonic of that frequency, to produce a down-converted receive signal.[5] The claimed method also requires the high-pass filtering of that down-converted receive signal, and the converting of the high-pass filtered down-converted receive signal to baseband.[6]

The invention claimed in this application provides important benefits in the removal of interference in a received signal by a frequency-division duplexed receiver. It has been observed

[1] Specification of S.N. 09/785,759, page 4, lines 1 through 9; Figure 1.,
[2] Specification, *supra,* page 4, lines 1 through 6; page 5, lines 1 through 8.
[3] Specification, *supra,* page 4, lines 4 through 9, 16, and 17; Figure 1.
[4] Specification, *supra,* page 4, lines 17 through 21; page 5, lines 1 through 6; Figure 1.
[5] Specification, *supra,* page 4, lines 1 through 6; page 5, lines 1 through 8.
[6] Specification, *supra,* page 4, lines 5 through 9, 19 through 21; page 5, lines 1 through 8.

that the largest interfering source, in the receiver of a frequency-division duplexed radio, is the output signal from the transmitter section.[7] According to this invention, this transmitter interference is removed by mixing the received signal with a local oscillator signal at the transmit band center frequency or one of its sub-harmonics. This mixing converts leakage interference at the transmit frequency to DC, allowing simple high-pass filters to easily remove that DC component and thus remove the transmitter interference.[8] In addition, image rejection is attained by the downstream sets of quadrature-phase mixers.[9] The claimed architecture and method achieve these important benefits without requiring expensive off-chip filters, yet avoiding performance issues presented by conventional direct-conversion receiver architectures.[10]

Grounds of Rejection to Be Reviewed On Appeal

Each of claims 1, 4, 5, 7, 10, 11, and 13 through 15 were finally rejected under §103 as unpatentable over the Morishige et al. reference[11] in view of the Matero reference[12], and further in view of the Moore reference[13].

Argument

It is axiomatic, in the patent law, that a *prima facie* obviousness determination of patent claims requires teachings from the prior art that disclose, suggest, or render the claimed subject matter obvious to a person of ordinary skill in the art.[14] If the Examiner fails to establish such a *prima facie* case, the obviousness rejection is improper and should be overturned on appeal.[15] To properly support a determination that it would have been obvious to combine known prior art elements to reach the claimed invention, there must be a finding that all of the claimed elements

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[7] Specification, *supra,* page 2, lines 7 through 9.
[8] Specification, *supra,* page 3, lines 10 through 14; page 4, lines 2 through 6, 16 and 17; page 5, lines 9 through 11.
[9] Specification, *supra,* page 3, lines 14 through 16; page 4, lines 16 through 18; page 5, lines 11 through 12.
[10] Specification, *supra,* page 3, lines 17 through 22.
[11] U.S. Patent No. 6,600,911 B1, issued July 29, 2003 to Morishige et al.
[12] U.S. Patent No. 6,215,988 B1, issued April 10, 2001 to Matero, on an application filed May 27, 1999, which is a continuation of an application filed May 15, 1997.
[13] U.S. Patent No. 4,766,392, issued August 13, 2988 to Moore.
[14] *In re Rijckaert*, 9 F.3d 1531, 1532, 28 USPQ2d 1955, 1956 (Fed. Cir. 1993).
[15] *Rijckaert, supra.*

were known in the prior art *and* that it would have been obvious to the person of ordinary skill in the art to have made that combination.[16]

In the context of examination of claims by the Patent and Trademark Office, the Supreme Court has recently warned against the application of improper hindsight, or *ex post* reasoning, in finding a claim to be obvious:

> [R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.[17]

Appellant submits that the rejection of the claims in this case is based on the very improper hindsight or *ex post* reasoning that the Supreme Court declared improper.

Specifically, Appellant submits that the final rejection under §103 of claims 1, 4, 5, 7, 10, 11, and 13 through 15, is in error because there is no teaching, suggestion, or motivation in the prior art to combine the teachings of the applied references in such a manner as to reach the claims, nor has the Examiner provided any other rational underpinning for the articulated reasoning upon which the rejection is based. Because of this error, the final rejection of claims 1, 4, 5, 7, 10, 11, and 13 through 15 should be reversed.

The rejection of claim 1 and its dependent claims

Regarding claim 1, the Examiner asserted that the Morishige et al. reference teaches all of the elements of the claim, except for mixers receiving a first local oscillator signal that has a frequency equal to the center frequency of the transmitter section or a sub-harmonic thereof, and except for the first and second high pass filters having inputs coupled to the outputs of the first and second mixers, respectively, and the downstream first and second sets of mixers.[18]

The Examiner asserted that the Matero reference teaches mixers that receive a local oscillator signal having a frequency equal to the transmit band center frequency or a sub-

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[16] *KSR International Co. v. Teleflex Inc et al.*, 550 U.S. ____, 127 S.Ct. 1727, 167 L.Ed.2d 705, 75 USLW 4289, 82 U.S.P.Q.2d 1385, (2007); *In re Dembiczak*, 175 F.3d 994, 999, 50 USPQ3d 1614 (Fed. Cir. 1999). *See also* MPEP §2143 (A) (in the context of the requirements for a *prima facie* case of obviousness).
[17] *KSR, supra,* S.Ct. at 1741, *citing In re Kahn,* 441 F.3d 977, 988 (Fed. Cir. 2006).
[18] Office Action of February 7, 2008, page 3.

harmonic thereof,[19] and that the Moore reference teaches the first and second high pass filters and the first and second sets of two mixers coupled to the output of the high pass filters, respectively. The Examiner also asserted that it would have been obvious to the skilled artisan to provide the teachings of the Moore reference into the modified method of the Morishige et al. and Matero references, "to better reduce distortion during demodulation".[20]

During prosecution, Appellant asserted that the rejection was in error because the cited location of the Matero reference referred to the application of the local oscillator frequency to the *transmit* modulator, and not to mixers in the receive path.[21] The cited location of the Matero reference reads:

> a *modulator* that *modulates* said local oscillator RF signal in accordance with information *to be transmitted* and that outputs a modulated RF signal, wherein when operating in said first frequency band said local oscillator RF signal has a frequency that is equal to said transmitted RF signal . . .[22]

In response to Appellant's argument, the Examiner asserted that the reference teaches elsewhere that this local oscillator signal is used for both the transmitter and receiver, such that this local oscillator frequency is fed to its receive mixers.[23] The Examiner further asserted that, according to the Matero reference, the transmit and receive frequency bands overlap, "meaning that in some cases, the transmit and receive frequencies can be the same"; the Examiner further asserted that, even if the receive local oscillator frequency is not exactly the same as the transmit frequency, it is at a sub-harmonic (one-half) of the transmit frequency.[24]

The Examiner also asserted, in response to Appellant's other arguments, that the teachings of the Moore reference are combinable with those of the Morishige et al. and Matero references, because all three references have similar frequency conversion circuits, and because replacing the band pass filters of the Morishige et al. reference with high pass filters of the

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[19] Office Action, *supra*, page 4, *citing* Matero, *supra,* at column 8, lines 17 through 22 (*i.e.,* its claim 1).
[20] Office Action, *supra,* page 4.
[21] Request for Reconsideration of November 19, 2007, page 2.
[22] Matero, *supra,* column 8, lines 17 through 22 (emphasis added).
[23] Office Action, *supra,* page 7.
[24] Office Action, *supra,* pages 7 and 8.

Moore reference would provide the benefit of "reducing distortion when the signal is recovered from baseband".[25]

Claims 4, 5, 7, and 13, each dependent on claim 1, were also rejected under §103, on the grounds that their limitations were also taught by the same combination of references.

One skilled in the art would not be motivated to combine the prior art in the manner alleged to reach claim 1 and its dependent claims

Appellant submits that the final rejection of claim 1 and its dependent claims 4, 5, 7, and 13, is in error because there is no indication in the prior art that a person of ordinary skill in the art, at the time of this invention, would have obviously combined the teachings of the applied references in such a manner as to reach the claim, nor is any other rational underpinning presented by the Examiner regarding why this skilled person would have so combined those teachings. Rather, Appellant submits that the combination alleged by the Examiner is improperly based on the hindsight use of Appellant's own teachings.

Appellant agrees with the Examiner that the Morishige et al. reference does not teach the receive mixers receiving a local oscillator signal having a frequency at the transmit band center frequency or a sub-harmonic thereof. However, Appellant submits that the prior art, including the Matero reference, would not lead the skilled person to have modified the teachings of the Morishige et al. reference to apply such a local oscillator frequency to the receive mixers. There is simply nothing in the prior art that would lead a person of ordinary skill in the art, using his or her ordinary creativity, to so modify the Morishige et al. receiver.

The Matero reference does not lead the skilled person to use the transmit band center frequency as a local oscillator frequency applied to receive mixers

As evident from the Morishige et al. reference, its receive mixers 4 are provided with a local oscillator signal that is at approximately one-half the received signal frequency, to produce I and Q channel baseband signals.[26] These baseband output signals are then filtered by a low

[25] Office Action, *supra,* page 8.
[26] Morishige et al., *supra,* column 7, lines 19 through 23; Figure 2.

pass filter 6, before demodulation.[27] Therefore, in order for the modification suggested by the Examiner to be obvious, one must have, or be provided with, good reason to change the local oscillator frequency of these mixers to the *transmit* frequency, and to then change the low-pass filters into high-pass filters. The Matero reference provides no such good reason.

First, Appellant submits that the teachings of the Matero reference are not concerned with the relationship between the transmit frequency, on one hand, and the local oscillator frequency for its receive operation, on the other. This lack of concern is evident from the various passages of the Matero reference that the frequency ranges of its synthesizer 46 (which derives the local oscillator signal F_1) can differ for receive operation from that used in transmit operation:

> The synthesizer 46 operates in the 883-908 MHz band during receive and in the 890-915 MHz band during transmission.[28]
>
> This embodiment provides good isolation from the transmitter to the synthesizer 46, which operates in the 869.5 – 914 MHz band during receive and in the 855 – 892 MHz band during transmission (*i.e.,* one half of the DCS frequency band).[29]
>
> This embodiment also provides good isolation from the transmitter to the synthesizer 46, which operates in the 942.5 – 972.5 MHz band during reception and in the 925 – 955 MHz band during transmission.[30]

The Examiner asserts that these passages of the Matero reference teach that the transmit and receive frequencies overlap.[31] Even with this overlap, however, the reference lacks any teaching that the local oscillator signal during receive either *is* or *ought to be* at the center frequency of the transmit band. Rather, each of these passages leaves a wide frequency band over which the local oscillator frequency can range. There is no statement in the Matero reference indicating any importance in setting the receive local oscillator frequency to the transmit band center frequency or a sub-harmonic.

Nor is there any hint from the Matero reference that the receive local oscillator frequency *should* be the transmit band center frequency. This is effectively admitted by the Examiner in the final rejection, by the statement:

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[27] *Id.,* at column 7, lines 23 through 28.
[28] Matero, *supra,* column 5, lines 38 through 40.
[29] Matero, *supra,* column 6, lines 1 through 5.
[30] Matero, *supra,* column 7, lines 4 through 7.
[31] Office Action, *supra,* page 7. *See also* Matero, *supra,* column 6, lines 45 through 48.

> Firstly, the transmit and receive frequencies overlap meaning that in some cases, the transmit and receive frequencies *can* be the same.[32]

Merely noticing, from the frequency ranges stated in the Matero reference, that the transmit and receive frequencies *can* be the same,[33] does not provide any motivation or suggestion to the skilled reader that the Morishige et al. system *should* be modified to set its receive local oscillator frequency to the transmit band center frequency or a sub-harmonic thereof. Indeed, the Matero reference shows no concern regarding whether the local oscillator frequency applied to the receive mixers is the same as the transmit frequency. This lack of concern is apparent from the use of band-pass filter 88 and intermediate frequency filter 40 downstream from the receive mixers 74, 60, respectively, in the Matero system; these filters indicate that the purposes of receive mixers 74, 60 is to partially down-convert the received signal. So long as the local oscillator frequency is effective in effecting partial down-conversion of the received signal, its particular frequency is not important, according to the Matero reference. As such, its synthesizer 46 generates a local oscillator frequency that results in intermediate frequencies, output by its down-conversion mixers, which are below 100 MHz for either of the dual bands supported.[34] The skilled reader of the Matero reference would thus be focused on this relationship of the local oscillator frequency to the desired intermediate frequency, and not to whether this local oscillator frequency is or is not the center transmit band frequency or a sub-harmonic.

In contrast, the invention of claim 1 and its dependent claims provides the new and unexpected advantage of eliminating interference from the strongest interference source in an FDD system. This advantage is attained directly by selecting the local oscillator frequency in the receive down-converter side to match the transmit band center frequency – as a result, the receiver mixers convert the transmit signal interference to DC, so that it is easily filtered from the resulting receive signal by a simple and inexpensive high-pass filter.[35] This important result of the invention of claim 1 is new and unexpected, relative to the prior art of record in this case. Accordingly, even if one accepts that the overlap of the transmit and receive frequency bands in the Matero reference "mean[s] that in some cases, the transmit and receive frequencies can be the

[32] Office Action, *supra,* page 7 (emphasis added).
[33] In the absence of any statement in the reference that these frequencies *are* the same.
[34] Matero, *supra,* column 4, lines 45 through 60.
[35] Specification, *supra*, page 3, lines 10 through 14.

same",[36] the invention of claim 1 and its dependent claims provides new and unexpected results relative to the prior art, thus overcoming any presumption of obviousness from those teachings of the reference.[37]

Appellant therefore asserts that the happenstance that the transmit and receive frequencies *can* be the same would not even be noticed by the skilled reader of the Matero reference. That is, unless that reader were already aware of, and were using, Appellant's own teachings regarding the benefit of that frequency selection. Of course, such hindsight analysis is improper in considering the obviousness of patent claims.[38]

The skilled person would not obviously modify the Morishige et al. system in the manner recited in claim 1

Even if the Matero reference can be interpreted as teaching the use of the center band transmit frequency (or a sub-harmonic) as the local oscillator frequency applied to receive mixers, Appellant further submits that it would not have been obvious to modify the Morishige et al. teachings in that manner, much less obvious to modify that combination to also provide high-pass filters as taught by the Moore reference.

It is useful to examine the purposes behind the Matero system to determine whether its same rationale would lead the skilled reader to address the Morishige et al. situation in that manner. In this regard, Appellant submits that the motivation behind the construction of the Matero system, as stated in the reference, is not pertinent to the situation presented by the Morishige et al. reference. The Matero reference is directed to a dual-band transmitter and receiver architecture, with its particular construction intended to reduce the component count and circuit complexity necessary to implement this dual band capability.[39] By "dual bands", the reference is referring to separate frequency band transceiver operation (*e.g.,* GSM and DCS1800, or DAMPS and DCS1900).[40] The Matero reference apparently accomplishes this by using the

[36] Office Action, *supra,* page 7.
[37] *Iron Grip Barbell Co. v. USA Sports Inc.,* 392 F.3d 1317, 73 USPQ2d 1225 (Fed. Cir. 2004).
[38] *KSR, supra.*
[39] Matero, *supra,* column 1, line 66 through column 2, line 10.
[40] Matero, *supra,* column 5, lines 19 and 21; column 6, lines 6 through 11.

same circuit functions in both of the dual frequency bands,[41] thus enabling "a 20 – 30% reduction in the number of components", including "eliminating a requirement to provide a frequency synthesizer for both bands".[42] This "dual-band" construction and operation is simply not mentioned or otherwise of concern in the Morishige et al. reference. Accordingly, the motivation presented by the Matero system for arranging its mixers and operating its synthesizer is not pertinent to the system disclosed in the Morishige et al. reference. One skilled in the art having reference to these references is therefore given no reason or hint to apply the teachings of the Matero reference in implementing a receiver according to the Morishige et al. reference.

Nor is there any motivation, to the skilled reader, to further modify these disparate teachings to also include the high-pass filters of the Moore reference. This absence of motivation is apparent from the different manner in which the various receivers recover information from a received signal. The Morishige et al. reference teaches an even harmonic quadrature receiver, in which the received signal is mixed with a local oscillator signal that is at one-half of the fundamental received signal frequency; the baseband signal resulting from this mixing is then filtered by a *low-pass* filter prior to demodulation.[43] In contrast, the Matero reference discloses a heterodyne receiver architecture in which the received signal is downconverted in frequency once or twice, to produce an intermediate frequency (IF) signal that is then *band-pass* filtered,[44] as is fundamental in the heterodyne receiver art. In both cases, the downstream filters are intended to keep the desired signal component (baseband and IF, respectively) while eliminating signal components outside of the desired band (interference, aliasing, and the like).

Why, then, would one skilled in the art be motivated to substitute the high-pass filter from the Moore reference for the low-pass filter of the Morishige et al. reference, or for the band-pass filter of the Matero reference? Such a substitution or combination, even if suggested,

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[41] Matero, *supra,* column 4, lines 27 through 38; column 5, lines 21 through 25, and lines 41 through 55.
[42] Matero, *supra,* column 7, lines 36 through 43.
[43] Morishige et al., *supra,* column 1, lines 24 through 42; column 7, lines 19 through 28.
[44] Matero, *supra,* column 1, lines 44 through 49; column 2, lines 27 through 44 ("The second filter of the signal conversion receiver has a center frequency in a range of approximately 45 MHz to approximately 60 MHz."); column 4, lines 53 through 57 (". . . since in both cases it is possible to achieve IF frequencies below 100 MHz."); column 5, lines 21 through 25 (". .. the 52 MHz IF filter 40, . . . ") and lines 50 through 54; column 6, lines 32 through 33.

would defeat the purpose of the receiver of either the Morishige et al. or Matero receivers. Use of a high-pass filter in the Morishige et al. reference would eliminate the baseband signal component while passing both aliasing and interference. Use of a high-pass filter in the Matero reference would retain aliasing in the signal to be processed by its IF signal processor (considering that the output frequencies from a mixer include signal components at the sum and difference values of the two frequencies, as known in the art). There is exactly no reason why one skilled in the art would include high-pass filters in the alleged receiver according to the modified Morishige et al. and Matero teachings.

Nor does the Examiner provide a cogent reason for making this modification. As noted above, the Examiner indicated that replacing filters of the Morishige et al. reference with the high-pass filters in the Moore reference would provide the benefit of "reducing distortion when the signal is recovered from baseband".[45] Appellant submits that this benefit is nowhere supported by the teachings of the references, nor by any other rational underpinning. Rather, Appellant respectfully submits that this statement is exactly the type of "mere conclusory statement" to which the Supreme Court has warned against as insufficient to support an obviousness determination.[46]

To summarize, Appellant submits that modification of the teachings of the Morishige et al. reference, to the extent necessary to reach claim 1, is not obvious from the teachings of the Matero and Moore references, even considering the ordinary creativity of a person of ordinary skill in the art. Nothing in the prior art, particularly the Matero reference, suggests to the skilled person that he or she ought to change the function of the receive mixers of the Morishige et al. receiver from converting the received signal to baseband (keeping the low frequency result via its low-pass filters), into the function of removing transmit interference by applying a local oscillator frequency at the transmit band center frequency or a sub-harmonic (and removing the DC result via the high-pass filters from the Moore reference). The Matero reference fails to suggest these modifications because its design approach is directed to sharing functions in a dual-band receiver, which is not the environment of the Morishige et al. reference. Furthermore,

[45] Office Action, *supra,* page 8.
[46] *KSR, supra,* S.Ct. at 1741, *citing In re Kahn,* 441 F.3d 977, 988 (Fed. Cir. 2006).

while the Matero reference discloses overlapping transmit and receive frequencies, the reference nowhere indicates or hints that any single frequency in the transmit band, much less the center frequency or a sub-harmonic, *ought* to be used as the local oscillator frequency applied to the receive mixers, for any purpose whatsoever.

The rejection of claim 1 and its dependent claims is based on improper use of Appellant's own teachings, in hindsight

Appellant surmises that the most reasonable interpretation of the final rejection is that the Examiner in fact engaged in the very hindsight use of Appellant's own teachings that the courts have held to be improper in the obviousness determination. Without using Appellant's own teachings about removing transmit interference from the receive signal in the claimed manner, how would the reader of the Matero reference even notice that the center frequency of the transmit band *can* be used as the local oscillator frequency applied to the receive mixers?[47] And without the use of Appellant's own teachings, how would this reader possibly conclude that the Morishige et al. receiver *ought* to be modified to use that center frequency of the transmit band as the receive side local oscillator frequency, and to then also substitute the high-pass filter from the Moore reference for the band-pass or low-pass filters in the other references (thus changing the mixer functions altogether)? Appellant submits that the final rejection of claim 1 and its dependent claims bears the classic hallmarks of improper hindsight: namely, identifying those claim limitations that are missing in a primary reference, and then going off to seek and find those missing limitations in other prior art references.

In conclusion, regarding claim 1 and its dependent claims

For these reasons, Appellant submits that the final rejection of claim 1 and its dependent claims is in error, and ought to be withdrawn.

[47] Office Action, *supra,* page 7.

The rejection of claim 14 and its dependent claims

Claim 14, and its dependent claims 10, 11, and 15, were finally rejected, under §103, on similar grounds, and applying the same analysis, as discussed above in connection with claim 1 and its dependent claims.[48]

One skilled in the art would not be motivated to combine the prior art in the manner alleged to reach claim 14 and its dependent claims

Appellant submits that the final rejection of claim 14 and its dependent claims 10, 11, and 15, is in error on similar grounds as discussed above relative to claim 1. In summary, Appellant submits that the rejection is in error because there is no indication in the prior art that a person of ordinary skill in the art, at the time of this invention, would have obviously combined the teachings of the applied references in such a manner as to reach the claim, and because the final rejection is not based on any other rational underpinning regarding why the skilled person would have so combined those teachings. Rather, Appellant submits that final rejection of claim 14 and its dependent claims is improperly grounded on the hindsight use of Appellant's own teachings.

Appellant's argument in this brief regarding claim 1 and its dependent claims apply in similar fashion to the final rejection of claim 14 and its dependent claims. Those arguments will now be summarized relative to claim 14 and its dependent claims, with detailed support for those arguments having been previously presented above relative to claim 1 and its dependent claims.

The Matero reference does not lead the skilled person to mix a receive signal with a local oscillator frequency equal to the transmit band center frequency or a sub-harmonic

As discussed above relative to claim 1, Appellant submits that the Matero reference provides no motivation to make the asserted modification of the Morishige et al. teachings, specifically to change the local oscillator frequency with which the received signal is mixed to equal the *transmit* frequency of the radio, and to also apply high-pass, rather than low-pass,

[48] Office Action, *supra,* pages 5 and 6.

filtering to the down-converted signal resulting from that mixing. This absence of motivation to so modify the Morishige et al. teachings is apparent from the Matero reference in several ways.

First, the Matero reference does not teach that the transmit band center frequency is or ought to be applied to a received signal by way of receive mixers. Nor does the Examiner assert that the reference does so teach. Rather, the Examiner finds several passages in which the Matero reference discloses overlapping frequency ranges for the transmit and receive frequencies,[49] and on the basis of the overlapping ranges, states that this overlap "mean[s] that in some cases, the transmit and receive frequencies *can* be the same".[50] Even if the reference so teaches, it still does not teach that these transmit and receive frequencies *ought* to be the same, much less motivate the skilled reader to modify the Morishige et al. teachings to mix the receive signal with a local oscillator signal at a frequency equal to the transmit band center frequency or a sub-harmonic. This lack of suggestion and motivation is apparent from the reasoning of the Matero reference itself, in which its synthesizer is described as generating a local oscillator frequency so that stages of the receiver-side down-conversion results in intermediate frequencies that are below 100 MHz for either of the two bands supported by the disclosed system.[51] The skilled reader would thus learn, from the Matero reference, only that he or she could arrange the various transmitter and receiver components and signals to obtain a desired intermediate frequency for both supported bands, but would not learn that the receive-side local oscillator frequency ought to be set at the center transmit band frequency or a sub-harmonic.

In addition, similarly as in the case of claim 1, the invention of claim 14 and its dependent claims also provides the new and unexpected advantage of eliminating interference from the strongest interference source in an FDD system, resulting directly from the mixing of the receive signal with a local oscillator frequency equal to the transmit center frequency or a sub-harmonic thereof. This mixing converts transmit-side interference (the strongest source of interference to the receiver) to a DC component that is easily removed in the filtering step, in a manner that can be simply and inexpensively realized in practice.[52] This new and unexpected

[49] Office Action, *supra,* page 7. *See also* Matero, *supra,* column 6, lines 45 through 48.
[50] Office Action, *supra,* page 7 (emphasis added).
[51] Matero, *supra,* column 4, lines 45 through 60.
[52] Specification, *supra*, page 3, lines 10 through 14.

benefit in the invention of claim 14, any presumption of obviousness resulting from any interpretation of the Matero reference regarding the overlap of the transmit and receive frequency bands.[53]

For these reasons, Appellant submits that the Examiner's discovery[54] that the alleged teachings in the Matero reference that the same transmit and receive frequencies *can* be used, would not teach the skilled reader to mix a receive signal with the transmit band center frequency.

The skilled person would not obviously modify the Morishige et al. system in the manner recited in claim 14

Assuming *arguendo* that the Matero reference can be interpreted as teaching the use of the center band transmit frequency (or a sub-harmonic) as the local oscillator frequency with which the receive signal is mixed, Appellant additionally submits that it would not have been obvious to modify the Morishige et al. teachings to perform that mixing, much less further modify that combination to apply high-pass filtering to the result of that mixing, as claimed.

As discussed above with respect to claim 1, the stated purpose behind the system operation described in the Matero reference is not pertinent to the operation of the Morishige et al. reference. The Matero reference is concerned with the construction and operation of a "dual-band" transmitter and receiver system, and more specifically with an architecture in which the component count and circuit complexity can be reduced;[55] the Matero reference accomplishes this by using the same circuit functions for each of the two supported bands,[56] including "eliminating a requirement to provide a frequency synthesizer for both bands".[57] This need and result has nothing to do with the Morishige et al. reference. Accordingly, Appellant submits that the skilled reader would not receive any hint from the Matero reference regarding why its receive-side mixing (even interpreted *arguendo* in the manner asserted by the Examiner) would be of use in the Morishige et al. receiver.

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[53] *Iron Grip Barbell., supra.*
[54] Such discovery necessarily made in hindsight, as discussed below.
[55] Matero, *supra,* column 1, line 66 through column 2, line 10.
[56] Matero, *supra,* column 4, lines 27 through 38; column 5, lines 21 through 25, and lines 41 through 55.
[57] Matero, *supra,* column 7, lines 36 through 43.

This lack of motivation is even further apparent when one considers that the rejection also requires the further modification of replacing low-pass filtering, in the Morishige et al. reference, with the high-pass filtering of claim 14. The different manner in which the receivers of the Morishige et al. and Matero references down-convert their received signals – different not only from one another but also from the claimed method – are especially illustrative of the absence of motivation from the prior art in this regard. As discussed above, the Morishige et al. reference teaches an even harmonic quadrature receiver that mixes the received signal with a local oscillator frequency of one-half of the fundamental received signal frequency, followed by *low-pass* filtering of the baseband signal resulting from such mixing.[58] The Matero reference discloses a heterodyne receiver that downconverts the received signal once or twice, depending on which of the dual-bands is enabled, to produce an intermediate frequency (IF) signal that is then *band-pass* filtered.[59] Regardless of how one combines these two references, it is impossible to see how it would have been obvious to substitute the *high-pass* filtering of the Moore reference into the alleged combination, considering that this type of filtering would necessarily defeat the purpose of the receiver, either by rejecting the desired signal, or by retaining aliasing or interference, or both, as discussed above relative to claim 1. Nor was the Examiner able to provide any rationale for such modification, other than a mere conclusory statement.[60]

Appellant therefore submits, as in the case of claim 1, that it would not have been obvious to a person of ordinary skill in the art, at the time of the invention, to modify the teachings of the Morishige et al. reference, to the extent necessary to reach claim 14. The teachings of the prior art provide no suggestion or motivation to make such modification, nor is there anything in the ordinary creativity of a person of ordinary skill in the art that would indicate that such modification ought to be made.

[58] Morishige et al., *supra,* column 1, lines 24 through 42; column 7, lines 19 through 28.
[59] Matero, *supra,* column 1, lines 44 through 49; column 2, lines 27 through 44; column 4, lines 53 through 57; column 5, lines 21 through 25; and lines 50 through 54; column 6, lines 32 through 33.
[60] *See KSR, supra.*

The rejection of claim 14 and its dependent claims is based on improper use of Appellant's own teachings, in hindsight

As discussed above relative to claim 1, Appellant again surmises that the most reasonable interpretation of the final rejection is that the Examiner in fact engaged in the very hindsight use of Appellant's own teachings that the courts have held to be improper in the obviousness determination. The guidance provided by advance knowledge of Appellant's teachings is essential for one to make the combination of teachings, and modification of that combination, necessary to arrive at the method of claim 14 and its dependent claims. No other approach is evident from the evidence. Appellant therefore submits that the final rejection of claim 14 and its dependent claims was, in fact, made using the improper hindsight application of Appellant's own teachings.

In conclusion, regarding claim 14 and its dependent claims

For these reasons, Appellant submits that the final rejection of claim 14 and its dependent claims is in error, and ought to be withdrawn.

In conclusion

For the foregoing reasons, Appellant respectfully submits that the final rejection of claims 1, 4, 5, 7, 10, 11, and 13 through 15 in this application is in error. Reversal of the final rejections of the claims in this case is therefore respectfully requested.

Respectfully submitted,
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Claims appendix:

1. A frequency division duplexed (FDD) radio, comprising:

a duplexer;

a transmitter section coupled to the duplexer, the transmitter section transmitting in a transmit frequency band having a center frequency;

a receiver section coupled to the transmitter section, for receiving a signal at a receive frequency that is different from the transmit band center frequency, the receiver section including a down conversion section comprising first and second mixers, said first and second mixers receiving a local oscillator (LO) signal having a frequency equal to the transmit band center frequency or a sub-harmonic thereof;

a first high pass filter having an input coupled to the output of the first mixer, and having an output;

a second high pass filter having an input coupled to the output of the second mixer, and having an output;

a first set of two mixers coupled to the output of the first high pass filter; and

a second set of two mixers coupled to the output of the second high pass filter.

4. A radio as defined in claim 1, wherein the first and second high pass filters comprise integrated DC blocking capacitors.

5. A radio as defined in claim 1, wherein the first and second high pass filters comprise cascaded single pole high pass filters.

7. A radio as defined in claim 1, wherein a first mixer of the first set of two mixers provides an in-phase (I) component at an output and a second mixer of the first set of two mixers provides a quadrature (Q) component at an output,

wherein a first mixer of the second set of two mixers provides an in-phase (I) component at an output and a second mixer of the second set of two mixers provides a quadrature (Q) component at an output;

and further comprising:

a first adder having a first input for receiving the output of the second mixer of the first set of two mixers, and a second input for receiving the output of the first mixer of the second set of two mixers, said first adder having an output for providing an in-phase component base band signal (B.B.I.); and

a second adder having a first input for receiving the output of the first mixer of the first set of two mixers, and a second input for receiving the output of the second mixer of the second set of two mixers, said second adder having an output for providing a quadrature component base band signal (B.B.Q.).

10. A method as defined in claim 14, wherein the high-pass filtering step comprises using one or more DC blocking capacitors to filter the down-converted receive signal.

11. A method as defined in claim 14, wherein the filtering step comprises using one or more cascaded single pole high pass filters to filter the down-converted receive signal.

13. A radio as defined in claim 1, wherein the first high pass filter passes frequencies including an intermediate frequency corresponding to a difference between the center frequency of the receiver section and the transmit band center frequency;

and wherein the second high pass filter passes frequencies including an intermediate frequency corresponding to a difference between the center frequency of the receiver section and the transmit band center frequency.

14. A method of operating a receiver in an FDD radio to remove, from a desired receive signal, interference caused by a transmitter transmitting at a transmit center frequency, the desired receive signal having a receive center frequency that is different from the transmit center frequency, comprising the steps of:

mixing the receive signal with a local oscillator frequency to provide a down-converted receive signal, the local oscillator frequency equal to the transmit center frequency or a sub-harmonic thereof;

high-pass filtering the down-converted receive signal; and

converting the high-pass filtered down-converted receive signal to a base-band signal.

15. The method of claim 14, wherein the mixing step comprises:

mixing the receive signal with the local oscillator frequency at a first phase to provide an in-phase down-converted receive signal component; and

mixing the receive signal with the local oscillator frequency at a quadrature phase, relative to the first phase, to provide a quadrature-phase down-converted receive signal component;

wherein the down-converted receive signal comprises the in-phase down-converted receive signal component and the quadrature-phase down-converted receive signal component.

Evidence appendix:

None.

Related proceedings appendix:

None.